

EXHAUST STACK AIR MONITOR SYSTEM MAINTENANCE, REPAIR, AND INSTALLATION

Purpose This Meteorology and Air Quality Group (MAQ) procedure describes requirements and instruction for the preventive maintenance, repair, and installation of exhaust stack air monitoring pumps, and related equipment.

Scope This instruction applies to all personnel responsible for the performance of work in support of the exhaust stack air monitoring system maintenance, repair, and installation program.

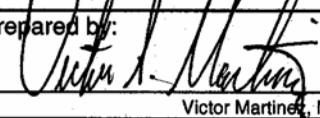
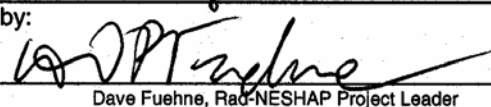
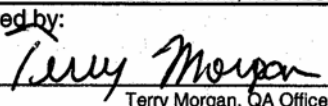
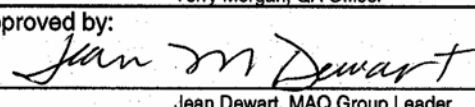
**In this
Procedure**

Topic	See Page
General Information About This Procedure	2
Who Requires Training to This Procedure?	2
Planning for Maintenance Work	4
Monthly Preventive Maintenance	6
Quarterly Preventive Maintenance	10
Semi-annual and Annual Preventive Maintenance	12
Alignment of Motor and Pump Shafts	14
Submitting Records of Work Performed	16
Records Resulting from This Procedure	17

**Hazard
Control Plan**

The non-office work steps in this procedure are not performed by MAQ personnel; thus no MAQ HCP has been prepared. It is the responsibility of the support service contractor to ensure all applicable hazards analyses have been performed according to applicable requirements.

Signatures

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04/25/03
04/21/03

CONTROLLED DOCUMENT

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General information about this procedure

Attachments This procedure has the following attachments:

Number	Attachment Title	No. of pages
1	Maintenance Schedule for Each Pump	2
2	Exhaust Stack Air Monitor System Checklist	2
3	Exhaust Stack Air Monitor System Pump/Motor Alignment Checklist	1
4	Confirmation of Sample Flow Calibration	1
5	Lubrication Plugs on Exhaust Stack Vacuum Pumps	1

History of revision

This table lists the revision history and effective dates of this procedure.

Revision	Date	Description Of Changes
0	9/30/99	New procedure replaces JCNNM procedure PMI 40-25-002.
1	2/20/01	Modified Attachment 1, deleted references to rebuilding pumps, deleted reference to RCA and TA-21-257, and minor procedural changes.
2	9/19/01	Modified Attachment 1 schedule.
3	04/25/03	Clarification of steps, change group names and references, changes to attachments, addition of “STACKS” database, and consolidation of checklists.

Who requires training to this procedure?

The following personnel require training before implementing this procedure:

- LANL and/or contract personnel who perform all or part of this procedure

Annual retraining is required and will be by **self-study (“reading”)** training.

Training method

The training method for this procedure is **on-the-job** training by a previously trained individual and is documented in accordance with the procedure for training (RRES-MAQ-024).

General information, continued

Prerequisites Personnel must have all of the training necessary to meet the performance standards required to complete the maintenance work outlined in this procedure (including, but not limited to):

- Site-specific training
- Radiation worker II training
- Basic Fall Protection; Course #13079
- MAQ-024, "Personnel Training"
- MAQ-026, "Deficiency Reporting and Correcting"

Definitions specific to this procedure None.

References The following documents are referenced in this procedure:

- MAQ-024, "Personnel Training"
- MAQ-RN, "Quality Assurance Project Plan for the Rad-NESHAP Compliance Project"
- MAQ-127, "Determination of Stack Gas Velocity and Flow in Exhaust Stacks, Ducts, and Vents"
- ANSI N13.1-1999, "Sampling and Monitoring Releases of Airborne Radioactive Substances From the Stacks and Ducts of Nuclear Facilities"
- 40 CFR 61, Subpart H, "National Emission Standards for the Emissions of Radionuclides other than Radon from Department of Energy Facilities"
- LIR 230-03-01, Facility Management Work Control
- LIR 300-00-02, Documentation of Safe Work Practices
- LIR 402-10-01, Hazard Analysis and Control for Facility Work
- LIR 402-860-02.1, Locking and Tagging equipment, Machinery and Systems
- LIR 404-00-03.1, Hazardous and Mixed Waste Requirements
- Sutorbilt Installation, Operation, Maintenance, Repair Manual for "F" Series Vacuum Pumps, Bulletin RME 28.

Note Actions specified within this procedure, unless preceded with "should" or "may," are to be considered mandatory guidance (i.e., "shall").

Planning for maintenance work

Schedule work on stack pumps

The KSL **Stationary Equipment Shop supervisor** schedules the appropriate maintenance on each pump listed in **Attachment 1** (“Maintenance Schedule for Each Pump”) and prepares required paperwork to initiate the maintenance.

Review scope of work

The KSL **Stationary Equipment Shop supervisor** or **appointed designee** reviews the requirements of the preventative maintenance work request. The supervisor assures the work package is complete and includes required permits prior to assigning craft personnel to perform work. The supervisor approves all changes in the scope of work and changes must be accepted by the FM or designated representative.

Assigning workers

The KSL **Stationary Equipment Shop supervisor** is responsible for the exhaust stack air monitoring system maintenance, repair, and installation program. The supervisor will:

- Determine and establish the job qualifications of craft personnel that maintain the air monitoring pump system
 - Arrange and track the training of the craft personnel
 - Establish and maintain program records and documentation
 - Enforce the requirements of this procedure during the performance of work
-

Assigning work

The **Shop foreman** is responsible for the assignment of qualified and properly trained craft to maintain, repair, and install exhaust stack air monitoring system components. The **foreman** assures that the necessary material, tools, and equipment are made available to the workers and that access to the work site is properly arranged and coordinated. The **foreman** also ensures that the workers complete the work in accordance with this procedure and that all documentation is verified correct.

Planning for maintenance work, continued

Pre-job briefing

The **craft foreman** refers to the activity hazard analysis (AHA) to know which personal protective equipment must be worn during maintenance, repair, and installation work.

The **craft foreman** reviews the contents of the work package before the job is started for each work location.

If necessary, the **craft foreman** briefs the work crew prior to being dispatched to perform any work. The briefing will include instruction on the job assignment, training requirements, job site procedures, necessary safety equipment, the appropriate MSDS information, and the hazards involved in the work.

Check-in at jobs

Follow check-in and check-out procedures as required for working in the facilities. The assigned **craft foreman** ensures that all check-in and check-out procedures are followed.

Potentially radioactive equipment

Any equipment installed to support processes characterized as potentially radioactive must be cleared and tagged by the site radiological control technician (RCT) before the equipment is removed from the controlled area.

Prior to beginning work, obtain any required Special Work Permits/Radiation Work Permits from the HSR-1 RCT.

Segregation of wastes

Used oil that is drained from vacuum pumps serving stack monitoring systems should be kept separate from all other oil. Consult with the facility Waste management coordinator, at the facility, for site specific requirements regarding the disposal of used oil.

Calibration and certification of measuring equipment

The **craft foreman** must verify that all measurement tool and instrument certifications are current and that the equipment is in proper operating order before being used.

In some instances, the manufacturer may recommend that a tool or instrument be verified using a reference standard provided with the tool. The craft foreman should perform such verifications before leaving the shop.

Monthly preventive maintenance

Frequency of preventive maintenance checks

Perform the steps in this chapter **every month** for the monthly preventive maintenance. These steps are also performed as part of the quarterly, semi-annual, and annual maintenance.

Report any problems

Report any structural or equipment deficiencies observed during the performance of work to RRES-MAQ personnel so that immediate remedial action can be taken, if required.

Equipment and supplies needed

Collect the following equipment and supplies before going to perform routine maintenance:

- Calibrated Air Flow Measurement Equipment.
- Plug-in "night" light
- Dial indicators used for alignment
- No. 2 bearing grease
- 30W non-detergent oil
- Commercially available cleaning detergent (such as Fantastik)
- Rags/terry-towels
- Temporary Oil storage container
- Rubber surgical gloves

Steps to perform monthly maintenance

Record the performance of the following steps on Attachment 2 ("Exhaust Stack Air Monitor System P.M. Checklist"). To conduct the monthly preventive maintenance, perform the following steps:

Step	Action
1	Follow the check-in procedure at the Facility by contacting the local zone supervisor and/or area RCT. Obtain approval to proceed to the stack monitoring system.
2	If necessary, don rubber gloves, booties, and any other PPE required to enter the workspace.
3	If stack monitoring equipment is not enclosed by a weather house, skip to step 5. If the monitoring system has a weather house, inspect the area surrounding the weather house for any off-normal conditions. If you suspect anything unusual, leave the area and contact the facility RCT. Do not return to the area unless the site RCT indicates that monitoring has been done and it is safe to work in the area.

Steps continued on next page.

Monthly preventive maintenance, continued

Step	Action
4	<p>Check the structural condition of the weather house. If any major structural repairs are necessary, report the problem to RRES-MAQ. RRES-MAQ will generate the appropriate paperwork to have the weather house repaired or replaced.</p> <p>Check the weather house access/panel door. Tighten loose connectors and replace missing bolts. Check the operation of the access door and repair or replace damaged hinges.</p> <p>Use a commercial cleanser (such as Fantastik) to clean any excessive oil and grease from the exterior of the weather housing.</p>
5	<p>If stack monitoring equipment is not operating:</p> <ul style="list-style-type: none"> • Check the electrical power source to the vacuum pump motor by using a plug-in light. If there is no power, contact the facility manager or other facility representative to get power restored. • If the plug-in light turns on, the source of the failure is with the stack monitoring equipment. Troubleshoot the equipment and determine if the equipment can be fixed or needs to be replaced. • Record the value displayed on the run timer indicator. Immediately contact RRES-MAQ personnel and provide information regarding the status of the stack monitoring system and the valued displayed on the run time indicator. • In areas where the stack monitoring system is served by a house vacuum system, immediately notify the area RCT and the Facility operation representative of the system status. • MAQ personnel will advise about continuing with remaining steps.
6	Visually check all electrical cords for cracks, breaks, electrical shorts or loose connections.
7	Check all air tubing systems for cracks, ruptures, pinched hoses, loose connections and/or air leaks. Check for restrictions to airflow in the pump hoses and the stack sample tube. Examine the flow meter and verify that all components are intact and functional. If an air leak is detected, make the necessary repairs to the system. Notify RRES-MAQ personnel and the area RCT of the findings.

Steps continued on next page.

Monthly preventive maintenance, continued

Step	Action
8	<p>While the pump is operating, check the flow rate reading on the flow meter. The floating ball should be centered on the 2 ACFM mark as indicated by the pointer flag (or mark in the vicinity of 40 LPM), unless specified otherwise by the RRES-MAQ Rad-NESHAP Project Leader. Check the current flow reading with the last entry on the blue Sample Flow Log tag located at the monitoring site.</p> <p>If the floating ball is suspended within 1/4 of the diameter of the ball above or below the set point, then proceed to the next step.</p> <p>If the flow rate needs adjustment, follow the steps for calibration of the flowmeter (see chapter <i>Quarterly preventive maintenance</i>). Record flow reading on Attachment 4, "Confirmation of Sample Flow Calibration" and fill in the blue Sample Flow Log.</p>
9	Check the filter housing unit, if possible, for physical damage and loose or cracked fitting connections.
10	Check the pump bearings for abnormal vibration.
11	Check the pump and motor for abnormal noise or overheating. Replace the failed component if necessary.
12	Unplug the electrical service to the pump motor.
13	Check shaft for alignment. Realign the shaft if necessary per chapter <i>Alignment of motor and pump shafts</i> .
14	<p>Lubrication is required every 500 hours of operation or monthly if the pump operates continuously. Pumps have two grease fittings which need No. 2 bearing grease. (see Attachment 5).</p> <p>NOTE: USE ONLY No. 2 BEARING GREASE TO LUBRICATE FITTINGS.</p> <p>During lubrication, the old grease will be forced out of the grease relief vents when the fittings are full. To prevent damage to the grease seals, the grease relief vents must be kept clean and unplugged.</p>
15	Check the pump air intake filter. Clean or replace if necessary.
16	Check the gaskets and seals for oil leaks.
17	Continue with the next steps to check the oil level.

Steps to check vacuum pump oil level

Record the performance of the following steps on Attachment 2 ("Exhaust Stack Air Monitor System P.M. Checklist"). To check the oil level of the vacuum pump, perform the following steps:

Step	Action
1	Ensure the pump is unplugged.

Steps continued on next page.

Monthly preventive maintenance, continued

Step	Action
2	Wear gloves when checking or changing oil.
3	Place a temporary oil container under oil level plug "B" (see Attachment 5) to catch any excess oil.
4	Remove the oil level plug "B" shown in Attachment 5. If oil drips out or is observed through open port "B", then there is sufficient oil in the pump reservoir. Proceed to step #8.
5	If no oil drips out of port "B" or is observed through open port "B", then oil must be added to the vacuum pump. Remove oil plug "A" as shown in Attachment 5. Fill the gear case slowly through vented oil plug opening "A" until the oil reaches the top of opening "B". Add only 30W non-detergent oil to bring level up to full. CAUTION: DO NOT OVERFILL THE GEAR CASE WITH OIL. Allow any excess oil to drip out of nipple "B" until it stops.
6	Remove temporary oil container and seal.
7	Reinstall vented oil plug "A".
8	Reinstall cap on nipple "B".
9	Use a commercial cleanser (such as Fantastik) to clean all excessive oil and grease from the exterior of the pump assembly.
10	Verify the vacuum system has been reassembled to normal operational mode. Restore power to vacuum pump and verify the system is operating correctly and that airflow is within acceptable parameters.
11	Clean all tools and dispose of all used rags and gloves in accordance with site-specific procedures established by HSR-1 personnel. If necessary, have the equipment and tools used to perform this work swiped by HSR-1 personnel for potential contamination.
12	Verify all work outlined in this section has been completed and properly documented on the appropriate checklists and on the blue tag "ESH-17 Sample Flow Log". Initial and date each entry.
13	Oil removed from pumps must be handled as potentially contaminated. Please refer to the Waste Profile Form, located in the work authorization package, for instructions on disposing of the used oil. In the event there are no special disposal requirements for the used oil, then the oil contained within the temporary container must be transferred to an approved storage container located at TA-54-421. When approved storage container is full, contact the Solid Waste Regulatory Compliance Group for guidance and assistance in disposing of the oil.

Acceptance of work

The **craft foreman** signs the preventive maintenance (PM) ticket indicating the work has been completed. The facility representative will sign the PM ticket to show acceptance of the work performed. The **craft foreman** leaves the preventive maintenance ticket (PM) with the facility management representative, as requested.

Quarterly preventive maintenance

Perform monthly preventive maintenance

Perform all work outlined in the chapter “*Monthly Preventive Maintenance*” and perform all work indicated in this chapter on a quarterly basis. Record the performance of the quarterly sample flow set point on **Attachment 2**, “Exhaust Stack Air Monitor System P.M. Checklist” and on the blue tag “ESH-17 Sample Flow Log”.

Special sample flow calibrations

In the event RRES-MAQ has requested a change to the sample flow set point, perform only the steps outlined in this chapter. After completing the work, **immediately** fill out the appropriate forms and submit or fax the forms to RRES-MAQ before the close of business.

Verify flow meter setpoint

After performing the monthly preventive maintenance steps, check the flow meter set point as described in the steps below.

Steps to check the flowmeter setpoint

To verify the flow meter set point, perform the following steps:

Step	Action
1	Verify that the airflow calibration instrument is in calibration by checking the calibration date on the calibration sticker. The magnehelic gauge on the calibrator reads 0 to 3 actual cubic feet per minute. The readings on the magnehelic gauge have been corrected for temperature (72°F) and pressure (7500 ft) during its annual calibration. The calibrator is equipped with a compatible ½" diameter poly-flow tubing for easy connection to the vacuum pump.
2	Place the calibrator on a level surface and check to ensure that the needle is on zero. The calibrator must be placed on a level surface or held in a level position so that an accurate reading can be obtained.
3	Disconnect the stack sample line, leading to the vacuum pump, at the poly-flow tubing upstream of the flow meter. Note: The poly-flow tubing must remain attached to the flow meter to ease in the connection to the calibrator.
4	Connect the poly-flow tubing to the outlet side of the calibrator. The outlet side of the calibrator is identified by an arrow indicating the direction of airflow.
5	Adjust the make-up valve on the vacuum pump until the desired airflow reading on the calibrator is obtained.

Steps continued on next page.

Quarterly preventive maintenance, continued

Step	Action
6	When the proper flow is obtained on the calibrator, position the pointer flag or use a wax pencil to mark the center of the float ball on the flow meter. Position yourself so that the flow meter float ball is at <u>eye level</u> during the reading. The flow meter is now properly set.
7	Disconnect the calibrator from the poly-flow tubing.
8	Reattach the poly-flow sample tube to the stack monitoring system as previously installed.
9	Readjust the airflow with the make-up valve, if required, so that the center of the float ball corresponds to the mark on the flow meter.
10	Record the sample flow calibration in Attachment 2 and on the blue tag "MAQ Sample Flow Log". Initial and date each entry.
11	Verify all work outlined in the monthly preventative maintenance section has been completed and properly documented in the checklists.

Duplicate flow measurement Within one week of the original flow verification set point measurement, perform one duplicate sample flow measurement for one sample pump. Record the system identification number and the results of this duplicate measurement at the bottom of Attachment 4, "Confirmation of Sample Flow Calibration." This duplicate sample flow measurement must be performed per the steps in this chapter.

Semi-annual and Annual preventive maintenance

Perform monthly and quarterly maintenance

Perform all work outlined in the chapters titled “*Monthly Preventive Maintenance*” and “*Quarterly Preventive Maintenance*” in addition to all the work indicated in this chapter on a semi-annual basis.

Note: Do not perform the steps for checking the vacuum pump oil level outlined on page 8. The oil will be replaced as part of the semi-annual preventive maintenance schedule.

Semi-Annual Oil Replacement

Every six months, replace the pump oil. Follow the steps below.

Steps to replace vacuum pump oil

Record the performance of the following steps on **Attachment 2** (“Exhaust Stack Air Monitor System PM Checklist”). To replace the oil of the vacuum pump, perform the following steps:

Step	Action
1	Unplug the vacuum pump from the electrical source.
2	Wear gloves when checking or changing oil.
3	Place the proper waste oil container under drain valve.
4	Use the attached 2" to 3" long nipple with a cock valve to drain the oil from the pump.
5	Loosen and remove plug “A” (see Attachment 5) to vent the oil chamber.
6	Remove the hand-tightened safety backup plug "C" (see Attachment 5) from the oil drain valve. Open the valve and allow sufficient time for all the oil to drain from the vacuum pump.
7	After the oil has drained from the pump, close the valve and reinstall the safety backup plug "C" onto the drain valve. Safety backup plug only needs to be hand tight.
8	Remove the oil level cap from nipple "B" as shown in Attachment 5.
9	Fill the gear case slowly through vented oil plug opening "A" until the oil reaches the top of opening "B". Add only 30W non-detergent oil to bring oil level up to port “B”. CAUTION: DO NOT OVERFILL THE GEAR CASE WITH OIL.
10	Allow excess oil to drip out of opening "B" until it stops.
11	Reinstall cap on nipple "B".
12	Reinstall vented oil plug "A".
13	Remove temporary oil container and seal.

Steps continued on next page.

Semi-annual and Annual preventive maintenance, continued

Step	Action
14	Use a commercial cleanser (such as Fantastik) and rags/terry towels to clean all excessive oil and grease from the exterior of the pump assembly.
15	Verify the vacuum system has been reassembled to normal operational mode. Restore power to vacuum pump and verify the system is operating correctly and that airflow is within acceptable parameters.
16	Clean all tools and dispose of all used rags and gloves in accordance with site-specific procedures established by HSR-1 personnel. If necessary, have the equipment and tools used to perform this work swiped by HSR-1 personnel for potential contamination.
17	<p>Dispose of used oil appropriately. Facilities may require the used oil to remain in the facility and be disposed of per facility waste management protocol. Please refer to the Waste Profile Form contained within the work authorization package for disposal instructions. In the event there are no special disposal requirements for the used oil, the following steps should be followed.</p> <p>Drain the used oil from the temporary oil waste container into an approved 5-gallon container located at TA-54-421. When the 5-gallon container is full, submit a sample of the contents to RRES-SWRC for analysis. Label the 5-gallon container to show the oil was collected from stack monitoring pumps and the date the sample was submitted to RRES-SWRC.</p>
18	If the analysis report shows that the oil <u>is</u> contaminated, then consult with RRES-SWRC to appropriately dispose of the oil. If the analysis report shows that the oil <u>is not</u> contaminated, then dispose/recycle the oil as ordinary waste oil. Maintain a copy of the analysis report for documentation purposes and forward the original analysis report to RRES-MAQ.

Annual replacement of air intake filter

Every year (in addition to the *Monthly Preventive Maintenance*, *Quarterly Preventive Maintenance*, and semi-annual oil replacement), replace the pump air intake filter. Record the replacement of the filter on **Attachment 2**, "Exhaust Stack Air Monitor System P.M. Checklist".

Verify proper operation

The **craft foreman** verifies that the exhaust stack air monitor pump system functioned properly during the post-maintenance/repair/installation operating test before the work is reported complete.

Alignment of motor and pump shafts

Alignment of shafts

Perform the steps in this chapter when installing or replacing pumps. The installation of couplings and subsequent shaft alignment can be done in accordance with manufacturer's recommendations or other approved methods.

Steps to align the shafts

Record the steps below on **Attachment 4** ("Exhaust Stack Air Monitor System Pump/Motor Alignment Checklist"). To align the shafts, perform the following steps:

Step	Action
1	Unplug the electrical service to the pump motor or lock-out and tag the circuit switch for safety. Follow lock out/tag out procedures.
2	Inspect all coupling components and remove all protective coatings or lubricants from bores, mating surfaces and fasteners.
3	Remove any burrs, etc. from the shafts.
4	Slide one coupling flange onto each shaft, using snug fitting keys where required. When installing the type B flanges, follow the instructions furnished with the Sure-Grip bushings.
5	Position the flanges onto the shaft to approximately achieve the G1 dimension shown in the table (see table below). It is usually best to have equal length of the shaft extending into each flange.
6	Move one flange to its final position on the shaft.
7	Torque the fasteners to manufacturers' specifications.
8	Slide the other flange far enough away to install the sleeve.
9	With a two-piece sleeve, do not move the wire ring to its final position, but allow it to hang loosely in the groove adjacent to the teeth.
10	Slide the loose flange onto the shaft until the sleeve is completely seated in the teeth of each flange. The G1 dimension is for reference and not critical to the installation work.
11	Secure the flange to the shaft.
12	Different coupling sleeves require different degrees of alignment. Locate the alignment values for your sleeve size and type in the table below.
13	Check for parallel alignment by placing a straightedge across the two coupling flanges. Measure the maximum offset at various points around the periphery of the coupling without rotating the coupling.
14	If the maximum offset exceeds the configuration shown under "Parallel" in the table below, then realign the shaft.
15	Check the angular alignment of the flange to the shaft with a micrometer or caliper. Measure from the outside of one flange to the outside of the other at intervals around the periphery of the coupling.

Steps continued on next page.

Alignment of motor and pump shafts, continued

Step	Action
16	Determine the maximum and minimum dimensions without rotating the coupling. The difference between the maximum and minimum must not exceed the figure given under "Angular" in the table below.
17	Realign shaft if a correction is necessary.
18	Recheck parallel alignment.
19	Recheck angular alignment.
20	Document all changes, repairs, and maintenance performed on each unit on Attachment 3 ("Exhaust Stack Air Monitor System Pump/Motor Alignment Checklist"). If the exhaust stack vacuum pump system is functioning properly, then mark the "Acceptance Check" as satisfactory ("S") on Attachment 2 (Exhaust Stack Air Monitor System Checklist).
21	Restore power to the pump.

Alignment specifications

Use the following table to determine the allowable misalignment, as described in the steps above.

MAXIMUM RPM AND ALLOWABLE MISALIGNMENT⁽¹⁾ (Dimensions in Inches)⁽²⁾ Sure-Flex Couplings - Types JE, JN, JES, JNS, E & N

SLEEVE SIZE	MAXIMUM RPM	PARALLEL	ANGULAR	G1
3	9200	.010	.035	1.188
4	7600	.010	.043	1.500
5	7600	.015	.056	1.938
6	6000	.015	.070	2.438 ⁽³⁾
7	5250	.020	.081	2.563
8	4500	.020	.094	2.938
9	3750	.025	.109	3.500
10	3600	.025	.128	4.063
11	3600	.032	.151	4.875
12	2800	.032	.175	5.688
13	2400	.040	.196	6.688
14	2200	.045	.242	7.750
16	1500	.062	.330	10.250

- NOTES: 1. Wood's General Catalog - Industrial Power Transmission Products, T. B. Wood's Sons Company, 440 North Fifth Avenue, Chambersburg, PA 17201 Phone 717 264-7161.
2. Values shown above apply if the actual torque transmitted is more than 1/4 the coupling rating. For lesser torque, reduce the above values by 1/2.
3. Values when using 6J flanges is 2.125.

Submitting records of work performed

Submit records

The **craft foreman** fills out all the necessary forms used to document the performance of this procedure and signs each data sheet. The **craft foreman** or **supervisor** submits all forms to the MAQ engineer by the last working day of the month. Include an official summary memo with the data package.

Review records

The **MAQ Engineer** performs a QA check on the submitted records and submits the records to the records coordinator **within 10 working days**. Forward a copy of Attachment 4 to appropriate Rad-NESHAP team members.

If sample flow rates have been modified, the **MAQ Engineer** enters this information into the STACKS database immediately after the change has taken place. Send an e-mail to all affected personnel indicating a change has taken place in the sample flow rate.

Records resulting from this procedure

Records

The **craft supervisor/foreman** submits the following records as a result of performing this procedure. The following records are to be submitted **by the last working day of the month** as records to the MAQ Engineer:

- Exhaust Stack Air Monitor System P.M. Checklist (Attachment 2)
- Exhaust Stack Air Monitor System Pump/Motor Alignment Checklist (Attachment 3)
- Confirmation of Sample Flow Calibration (Attachment 4)
- Copy of oil analysis report (from RRES-SWRC)

MAINTENANCE SCHEDULE FOR EACH PUMP

Stack ID	Equipment ID	January	February	March	April	May	June	July	August	September	October	November	December
3-0029-N14	ASE-1	Q	M	M	S	M	M	Q	M	M	A	M	M
3-0029-N15	ASE-1	Q	M	M	S	M	M	Q	M	M	A	M	M
*Note: Vacuum pump ASE-1 serves 2 sampling systems. Each sampling system has a rotometer which requires monthly verification and quarterly calibration.													
3-0029-N19	ASE-2	Q	M	M	S	M	M	Q	M	M	A	M	M
3-0029-N20	ASE-2	Q	M	M	S	M	M	Q	M	M	A	M	M
*Note: Vacuum pump ASE-2 serves 2 sampling systems. Each sampling system has a rotometer which requires monthly verification and quarterly calibration.													
3-0029-N23	ASE-3	Q	M	M	S	M	M	Q	M	M	A	M	M
3-0029-N24	ASE-3	Q	M	M	S	M	M	Q	M	M	A	M	M
*Note: Vacuum pump ASE-3 serves 2 sampling systems. Each sampling system has a rotometer which requires monthly verification and quarterly calibration.													
3-0029-N28	HOUSE VAC	Q	M	M	Q	M	M	Q	M	M	Q	M	M
3-0029-N29	HOUSE VAC	Q	M	M	Q	M	M	Q	M	M	Q	M	M
*Note: Each sampling system has a rotometer that requires monthly verification and quarterly calibration.													
3-0029-N32	ASE-4	Q	M	M	S	M	M	Q	M	M	A	M	M
3-0029-N33	ASE-4	Q	M	M	S	M	M	Q	M	M	A	M	M
*Note: Vacuum pump ASE-4 serves 2 sampling systems. Each sampling system has a rotometer which requires monthly verification and quarterly calibration.													
3-0029-37	ASE-12	Q	M	M	S	M	M	Q	M	M	A	M	M
3-0029-44	ASE-9	Q	M	M	S	M	M	Q	M	M	A	M	M
3-0029-45	ASE-9	Q	M	M	S	M	M	Q	M	M	A	M	M
3-0029-46	ASE-9	Q	M	M	S	M	M	Q	M	M	A	M	M
*Note: Vacuum pump ASE-9 serves 3 sampling systems. Each sampling system has a rotometer which requires monthly verification and quarterly calibration.													
3-0102-22	ASE-2	Q	M	M	S	M	M	Q	M	M	A	M	M
3-0141-01	ASE-1	Q	M	M	S	M	M	Q	M	M	A	M	M
48-0001-07	ASE-7	Q	M	M	S	M	M	Q	M	M	A	M	M
48-0001-54	ASE-4	Q	M	M	S	M	M	Q	M	M	A	M	M
48-0001-60	ASE-1	Q	M	M	S	M	M	Q	M	M	A	M	M
50-0001-02	ASE-1	Q	M	M	S	M	M	Q	M	M	A	M	M
50-0037-01	ASE-1	Q	M	M	S	M	M	Q	M	M	A	M	M
50-0069-03	HOUSE VAC	Q	M	M	Q	M	M	Q	M	M	Q	M	M
*Note: Sampling system at TA-50-69-03 has a rotometer which requires monthly verification and quarterly calibrations only.													
53-0003-03	ASE-1	M	M	M	S	M	M	M	M	M	A	M	M
53-0003-03	ASE-2	M	M	M	S	M	M	M	M	M	A	M	M
53-0003-03	ASE-3	M	M	M	S	M	M	M	M	M	A	M	M

Stack ID	Equipment ID	January	February	March	April	May	June	July	August	September	October	November	December
53-0007-02	ASE-1	M	M	M	S	M	M	M	M	M	A	M	M
53-0007-02	ASE-2	M	M	M	S	M	M	M	M	M	A	M	M

***Note: Sampling systems at TA-53 do not require quarterly sample flow checks. Facility personnel perform these checks daily.**

LEGEND: **M** = Perform Monthly PM

Q = Perform Quarterly PM

S = Perform Semi-Annual PM

A = Perform Annual PM

Form MAQ-132 Attachment 1

PAGE 2 OF 2

Meteorology and Air Quality Group

EXHAUST STACK AIR MONITOR SYSTEM CHECKLIST

PAGE 1 OF 2

This form is from MAQ-132

TA _____ Bldg. _____ Room _____ Equipment I.D. Code _____

Mfg. _____ Model no _____ Serial no _____

Type of P.M.(check one): Monthly ☐ Quarterly ☐ Semi-annual ☐ Annual ☐

P.M. No.: _____ Completion Date: ____/____/____

Step	Item	S	U	N/A	COMMENTS
PRE-INSPECTION/MONITORING (MONTHLY)					
P. 6, Step 2	Don gloves and other PPE, if required				
P. 6, Step 3	Inspect area for off-normal conditions				
P. 7, Step 4	Check structural condition of weather house				
P. 7, Step 4	Clean oil and grease from weather house				
P. 7, Step 5	Check electrical operation				
P. 7, Step 6	Check for cord cracks, breaks				
AIRFLOW EQUIPMENT (MONTHLY)					
P. 8, Step 7	Check tubing/fittings, flowmeter condition				
P. 8, Step 8	Check flowmeter setpoint.				Record on Attachment 4.
P. 10, Step 1-11	If flow needs adjustment				Record on p. 2 this form.
P. 8, Step 9	Check filter housing				
VACUUM PUMP UNIT (MONTHLY)					
P. 8, Step 10	Check for any vibration				
P. 8, Step 11	Check for any excessive noise, overheating				
P. 8, Step 12	Unplug vacuum pump				
P. 8, Step 13	Check for shaft misalignments				
P. 14	If shaft alignment required				Use Attachment 3.
P. 8, Step 14	Grease pump (no. 2 lube)				
P. 8, Step 15	Check pump intake filter. Replace if dirty.				
P. 8, Step 16	Check for oil leaks, clean if necessary				
P. 9	Dispose of rags, gloves properly				
CHECK OIL LEVEL (MONTHLY)					
P. 8, Step 1	Unplug vacuum pump				
P. 9, Step 2	Don gloves and other PPE, if required				
P. 9, Step 3	Place oil catch container				
P. 9, Step 4	Remove oil level plug "B"				
P. 9, Step 5	If oil low, remove oil fill plug "A"				
P. 9, Step 5	Fill gear case with oil SLOWLY				
P. 9, Step 7	Reinstall vented oil plug "A"				
P. 9, Step 8	Reinstall cap on oil level nipple "B"				
	(continued on next page)				

Place check under "S" if satisfactory, "U" if unsatisfactory, or "N/A" if not applicable.

Advise foreman or supervisor of problems involving imminent danger.

Meteorology and Air Quality Group
EXHAUST STACK AIR MONITOR SYSTEM CHECKLIST PAGE 2 OF 2
This form is from MAQ-132

(Continued from page 1)

Step	Item	S	U	N/A	COMMENTS
CHECK OIL LEVEL (MONTHLY)					
P. 9, Step 9	Clean excessive oil and grease from pump				
P. 10, Step 11	Decontaminate tools, dispose of rags/gloves				
P. 10, Step 12	Make entries in blue log, initial and date				
P. 10, Step 13	Dispose of oil properly				
FLOWMETER CALIBRATION (QUARTERLY)					
P. 10, Step 1	Check for calibration				
P. 10, Step 2	Check for zero on calibrator				
P. 10, Step 3	Disconnect sample line				
P. 10, Step 4	Connect to outlet of calibrator				
P. 10, Step 5	Adjust make-up valve to obtain flow rate				
P. 11, Step 6	Mark setpoint on flowmeter				
P. 11, Step 7	Disconnect calibrator				
P. 11, Step 8	Reconnect sample line				
P. 11, Step 9	Adjust airflow valve to setpoint				
P. 11	Perform one duplicate flowmeter check				Record on Attachment 4
OIL REPLACEMENT (SEMI-ANNUAL)					
P. 12, Step 1,2	Unplug, don gloves				
P. 13, Step 4	Use nipple w/cock valve to drain oil				
P. 12, Step 5,6	Remove plug "A"				
P. 12, Step 6	Open drain valve "C." Allow oil to drain				
P. 12, Step 7	Close valve, install plug "C"				
P. 12, Step 8	Remove plug "B"				
P. 12, Step 9	Fill gear case with oil SLOWLY				
P. 12, Step 11	Reinstall oil level cap "B"				
P. 12, Step 12	Reinstall oil level plug "A"				
P. 13, Step 14	Clean excessive oil and grease from pump				
P. 13, Step 15	Turn on pump				
P. 13, Step 18	Dispose of oil properly				
VACUUM PUMP UNIT (ANNUAL)					
P. 14	Replace air intake filter				
EXHAUST STACK PUMP SYSTEM ACCEPTANCE					
P. 10, 12, 14	Acceptance check				

Rotometer Reading: _____ **Actual Sample Flow:** _____

REMARKS: _____

Craft Foreman Signature _____ Name (print) _____ Z no. _____ Date _____

Meteorology and Air Quality Group

EXHAUST STACK AIR MONITOR SYSTEM PUMP/MOTOR ALIGNMENT CHECKLIST

PAGE 1 OF 1

This form is from RRES-MAQ-132

TA _____ Bldg. _____ Room _____ Equipment I.D. Code _____

Mfg. _____ Model no _____ Serial no _____

P.M. No.: _____ Completed P.M. Date: ____ / ____ / ____

This inspection was conducted according to procedure RRES-MAQ-17-132.

Step	Item	S	U	N/A	COMMENTS
EXHAUST STACK PUMP ALIGNMENT					
P. 15, Step 1	Unplug or lock out/ tag out				
P. 15, Step 2	Inspect, prepare coupling parts				
P. 15, Step 3	Remove burrs from shaft				
P. 15, Step 4	Slide flanges onto shaft				
P. 15, Step 5	Initial position flanges to G1 dimension				See table on p. 16
P. 15, Step 6	Move one flange to final position				
P. 15, Step 7	Torque fasteners				
P. 15, Step 8	Install sleeve				
P. 15, Step 9	Do not move wire ring				
P. 15, Step 10	Install loose flange, seat sleeve in teeth				
P. 15, Step 11	Secure flange to shaft				
P. 15, Step 12	Get alignment dimensions				
P. 15, Step 13	Check parallel alignment,				
P. 15, Step 14	Realign shaft if needed				
P. 15, Step 15	Check angular alignment				
P. 16, Step 16	Get max & min dimensions, check				
P. 16, Step 17	Realign shaft if needed				
P. 16, Step 18	Recheck parallel alignment				
P. 16, Step 19	Recheck angular alignment				
P. 16, Step 20	Document changes, repairs on this form				
P. 16, Step 21	Restore power to pump				

REMARKS: _____

**Place check under "S" if satisfactory, "U" if unsatisfactory, or "N/A" if not applicable.
Advise foreman or supervisor of problems involving imminent danger.**

Craft Foreman Signature _____

Name (print) _____

Z no. _____

Date _____

Meteorology and Air Quality Group

CONFIRMATION OF SAMPLE FLOW CALIBRATION

PAGE 1 OF 1

This form is from MAQ-17-132

TA-Bldg.	Stack number	Sample flow calibration completed	Original rotometer reading	New rotometer reading	Flow setpoint (actual cfm)	Date completed	Comment
03-0029	ES-14N	Yes No NA					
	ES-15N	Yes No NA					
	ES-19N	Yes No NA					
	ES-20N	Yes No NA					
	ES-23N	Yes No NA					
	ES-24N	Yes No NA					
	ES-28N	Yes No NA					
	ES-29N	Yes No NA					
	ES-32N	Yes No NA					
	ES-33N	Yes No NA					
	ES-37	Yes No NA					
	ES-44/FE-44	Yes No NA					
	ES-44/FE-45	Yes No NA					
	ES-44/FE-46	Yes No NA					
03-0102	ES-22	Yes No NA					
03-0141	ES-01	Yes No NA					
48-0001	ES-7	Yes No NA					
	ES-54	Yes No NA					
	ES-60	Yes No NA					
50-0001	ES-2	Yes No NA					
50-0037	ES-1	Yes No NA					
50-0069	ES-3	Yes No NA					
53-0003	ES-3, ASE-01	Yes No NA					
	ES-3, ASE-02	Yes No NA					
	ES-3, ASE-03	Yes No NA					
53-0007	ES-2, ASE-01	Yes No NA					
	ES-2, ASE-02	Yes No NA					
		Yes No NA					Quarterly Sample flow Calibration Check

Craft Foreman Signature

Name (print)

Z no.

Date

LUBRICATION PLUGS ON EXHAUST STACK VACUUM PUMPS

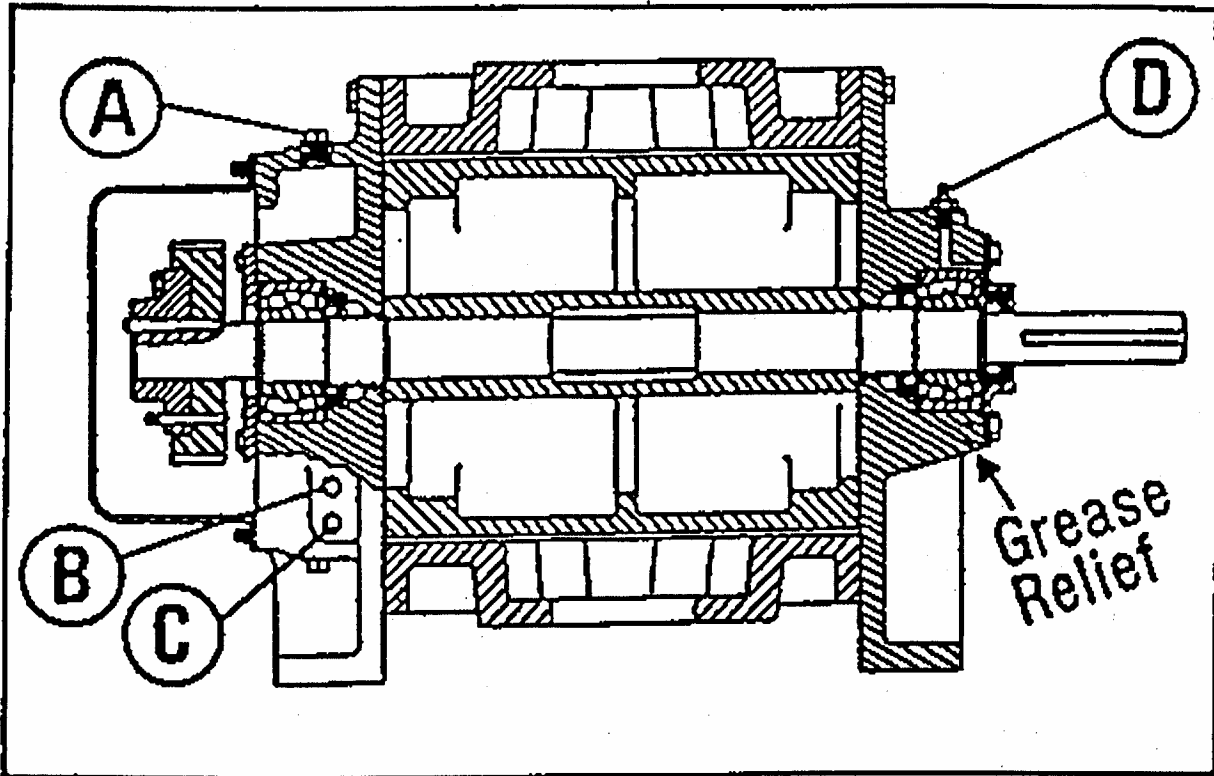


FIGURE A-1 EXHAUST STACK VACUUM PUMPS - LUBRICATION PLUGS

NOTES:

1. Plug "A" - Square head vented oil fill plug.
2. Plug "B" - Oil level plug.
3. Plug "C" - Oil drain plug.
4. Plug "D" - Bearing grease fitting.